

ABSTRACT:

The invention relates to the use of gas cavities to reduce frictional drag on underwater surfaces such as hydrofoils, struts, fins, rudders, keels, propeller blades, ship hulls, underwater bodies, and wetted surfaces in general. Each gas-filled cavity is formed behind a discontinuity in the surface that causes the water boundary layer to separate from the surface. Gas is ejected into a region behind the discontinuity to fill the cavity; the gas can be air. If a cavity is open to the atmosphere, then air can typically fill the cavity naturally without air ejection. Cavities can either be closed or open. A low drag hydrofoil may have a closed cavity on one side, and an open cavity on the other side. For closed cavities, the underlying surface can be shaped to minimize cavity closure drag. Various ways to generate cavities, change hydrodynamic forces, and duct gas internally on hydrofoils and struts with cavities are covered. Different designs of hydrofoil boats, hydrofoil ships and ship hulls that are amenable to drag reduction are presented.

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